The role of sea ice habitats in structuring the under-ice community during Antarctic winter

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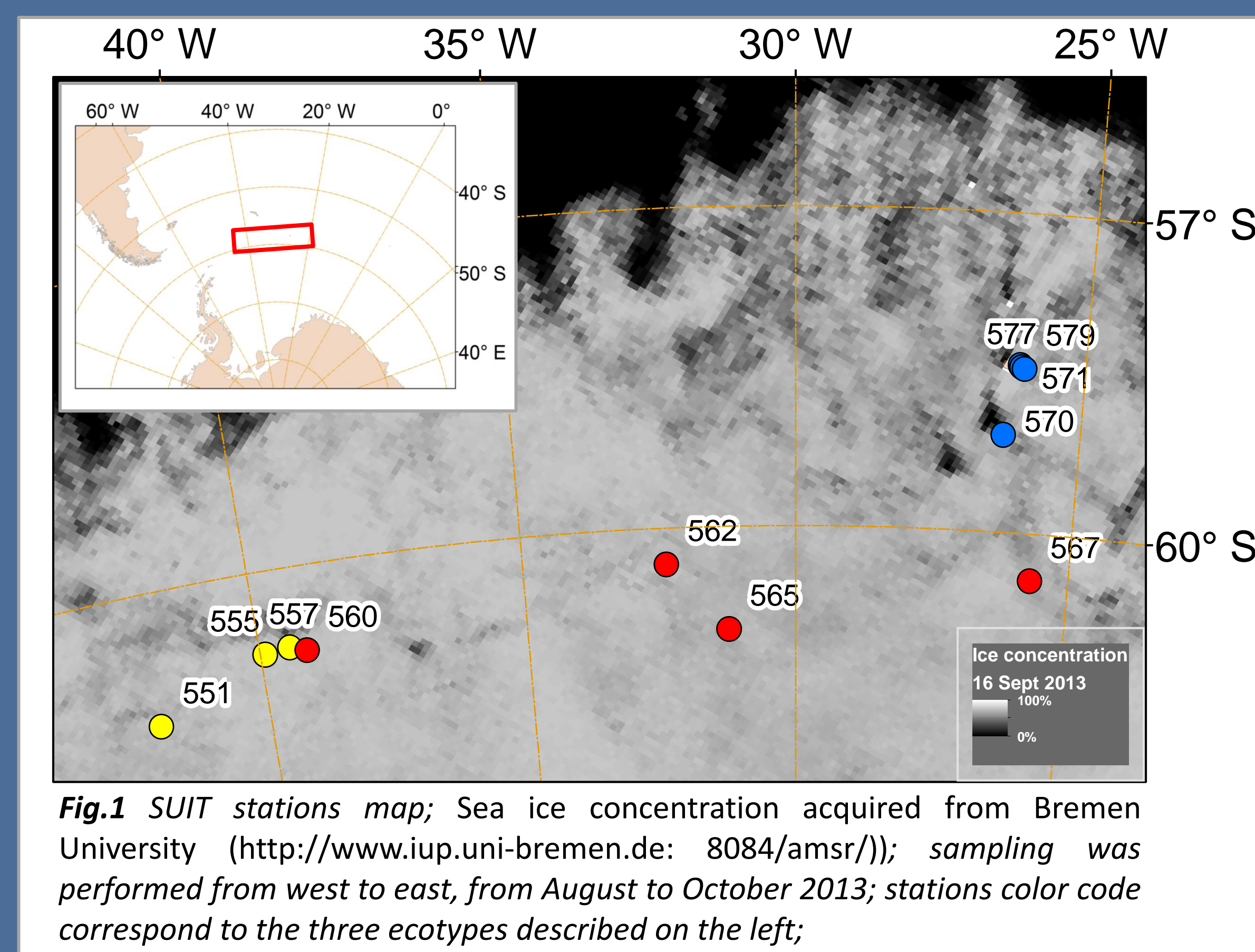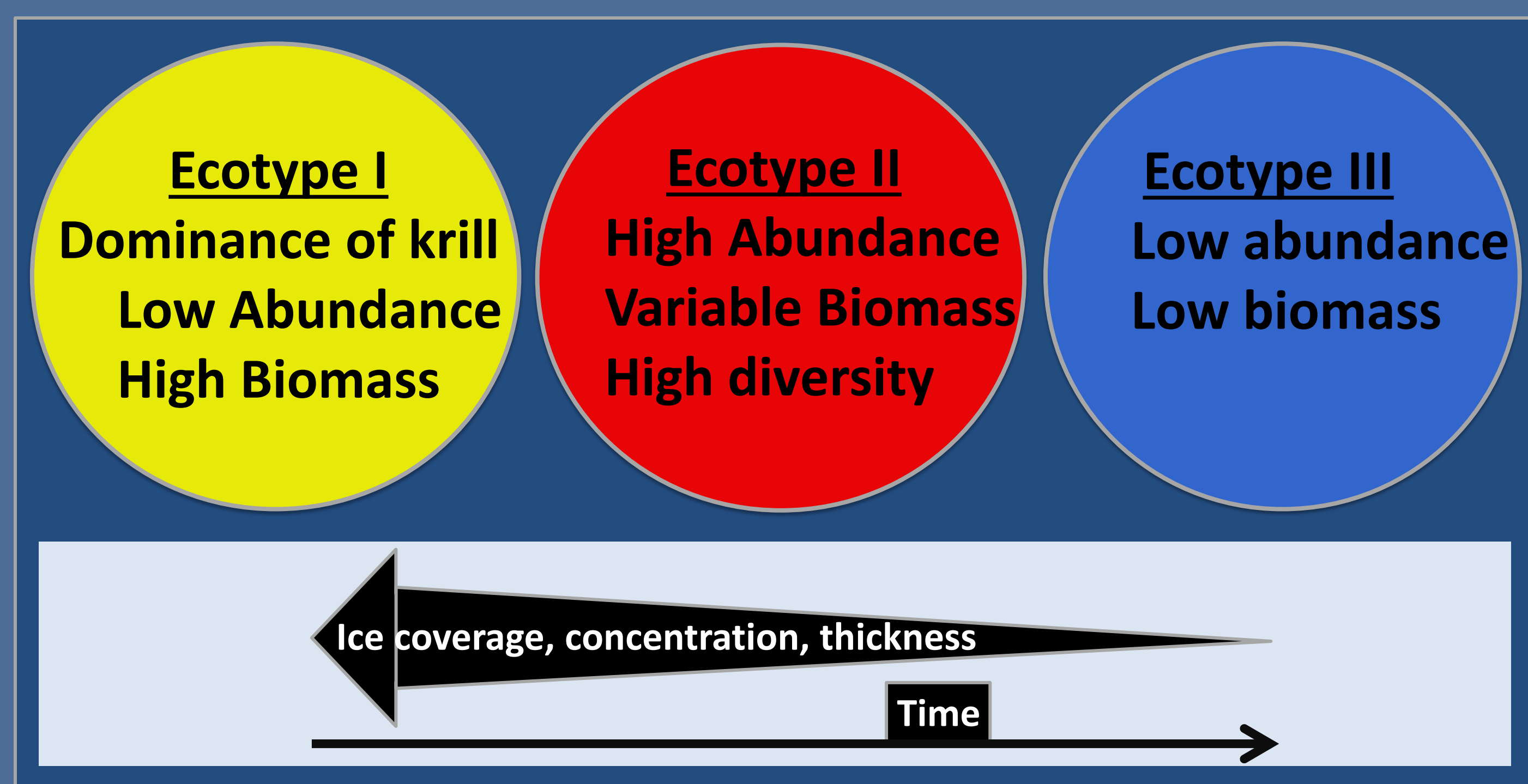[3] IMARES Wageningen UR, 1790 AD Den Burg (Texel), The Netherlands

Graphics by GEO Grafik/Illuteam43

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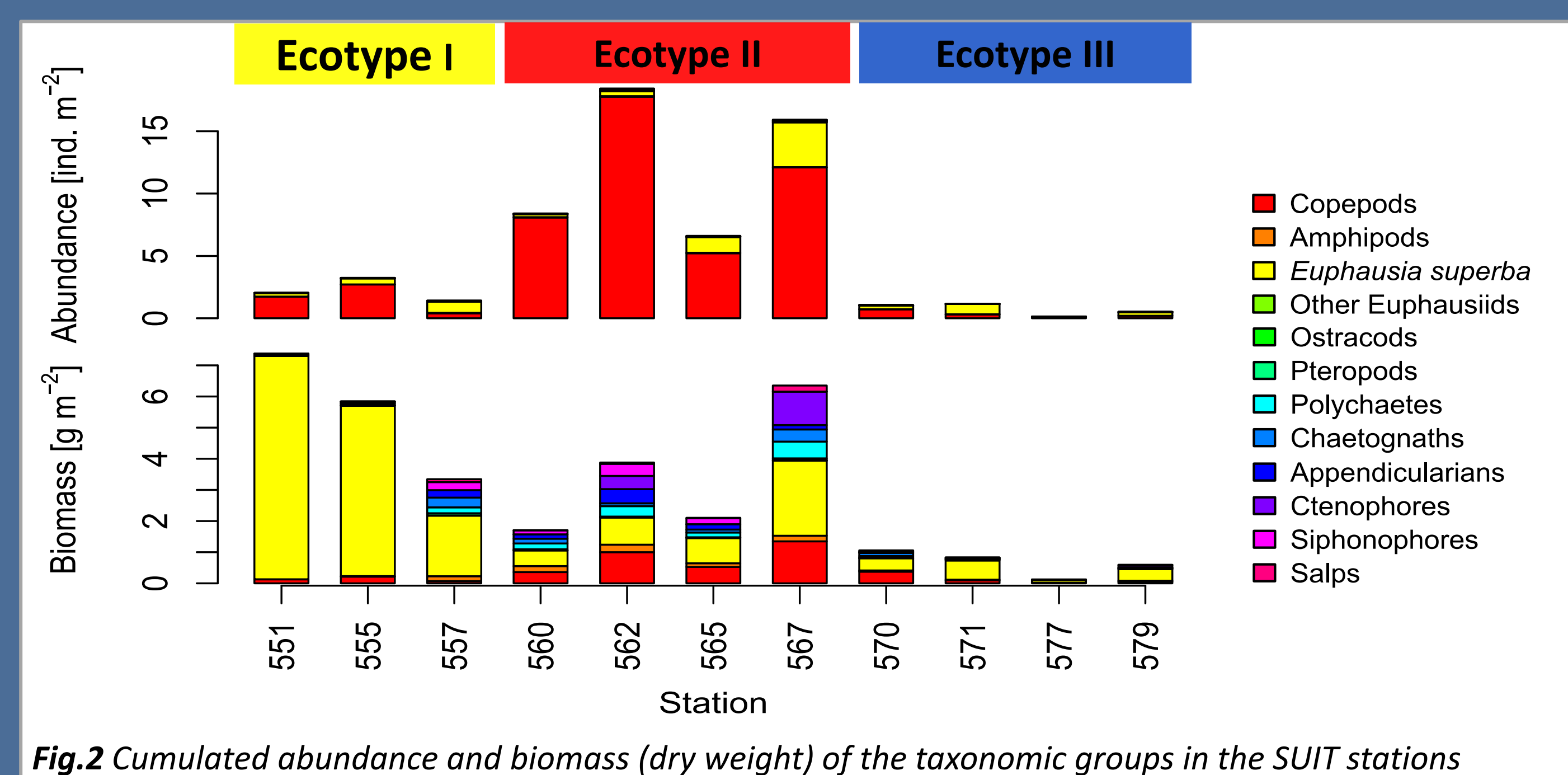
INTRODUCTION Sea ice habitats are changing in some parts of the Antarctic Ocean. Sea ice hosts a specific algal community that can serve as a critical carbon source for juveniles Antarctic krill *Euphausia superba* and other species during winter. Therefore, changes of sea ice habitats can have a significant impact on ecosystem functioning. During a winter expedition in the Weddell Sea in 2013, we studied the community composition of under-ice fauna using a Surface and Under-Ice Trawl (SUIT) (in the upper image) equipped with a bio-environmental sensor array (CTD, altimeter, ADCP, video camera, two Hyperspectral radiometers).
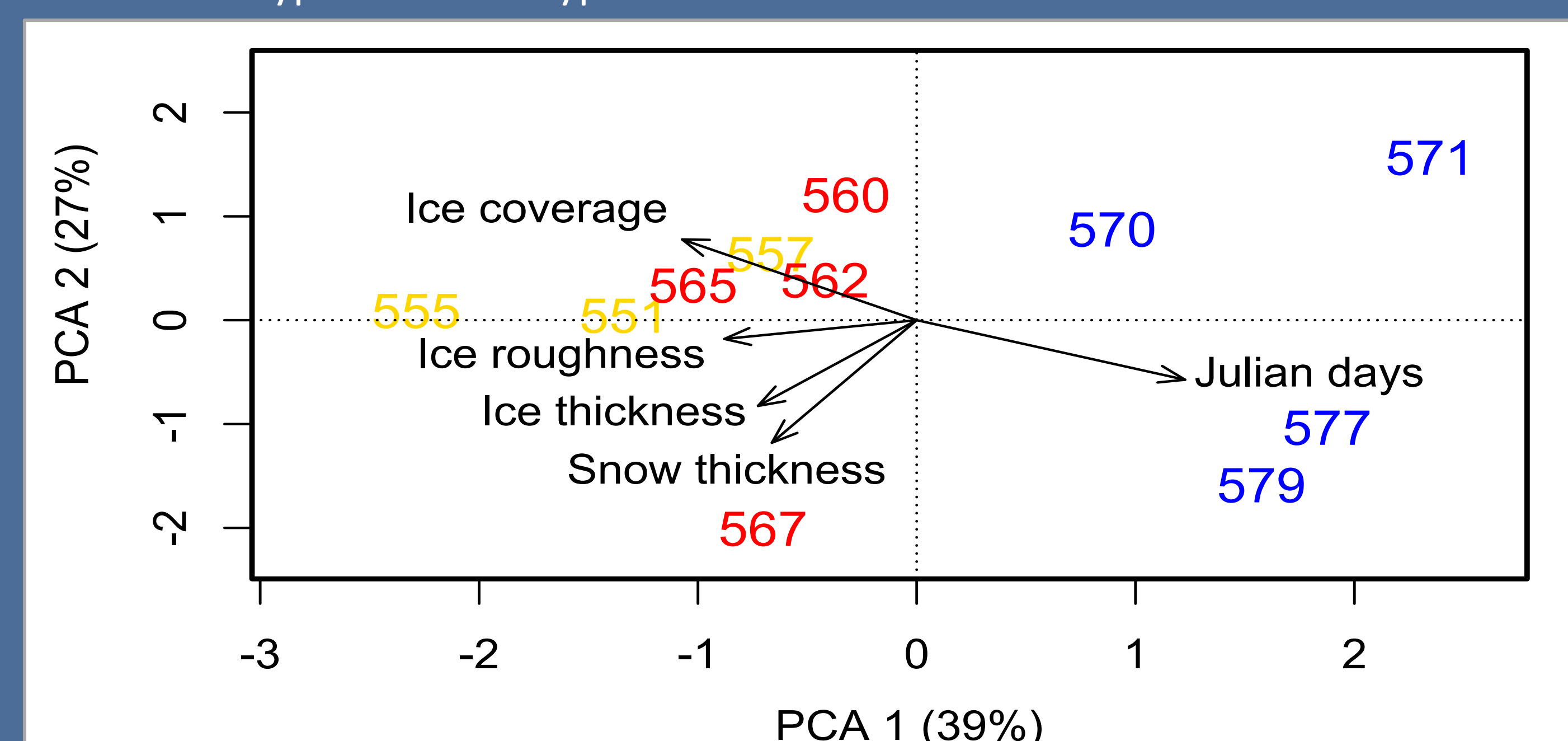
Ecotype I
Dominance of krill
Low Abundance
High Biomass

Ecotype II
High Abundance
Variable Biomass
High diversity

Ecotype III
Low abundance
Low biomass

Ice coverage, concentration, thickness

Time

Fig.1 SUIT stations map; Sea ice concentration acquired from Bremen University (http://www.iup.uni-bremen.de: 8084/amsr/)); sampling was performed from west to east, from August to October 2013; stations color code correspond to the three ecotypes described on the left;

UNDER-ICE FAUNA

Abundance and **biomass** differentiated 3 ecotypes

Legend: Copepods, Amphipods, *Euphausia superba*, Other Euphausiids, Ostracods, Pteropods, Polychaetes, Chaetognaths, Appendicularians, Ctenophores, Siphonophores, Salps

Fig.2 Cumulated abundance and biomass (dry weight) of the taxonomic groups in the SUIT stations

SEA ICE HABITATS

Ice conditions varied spatially and seasonally. Higher **ice concentration**, **thickness** and **roughness** were encountered at the first stations and decrease to left on the PCA ordination (Fig.3). **Snow thickness** differentiates within groups' stations ecotype II and ecotype III.

Fig.3 Principal component analysis on sea ice properties describing the under-ice habitats; stations color code correspond with the 3 ecotypes described above.

SEA ICE HABITATS

Thickness profiles (Fig.4) reveal differences of the under side of ice. An example where **rough sea ice** with the presence of ridges of 6-8m in station 565, contrasts with station 570 where **flat ice** dominates.

Fig.4 Sea ice thickness profiles of two SUIT hauls; photo made during trawling with the video camera attached to SUIT frame

CONCLUSION

- **Differences in community are dictated by sea ice properties, with a strong seasonal signal**
- **Antarctic krill (predominantly larvae) are associated with higher sea ice roughness**
- **Higher species diversity is associated with thicker ice**

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Ice-ecosystem carbon flux in polar oceans